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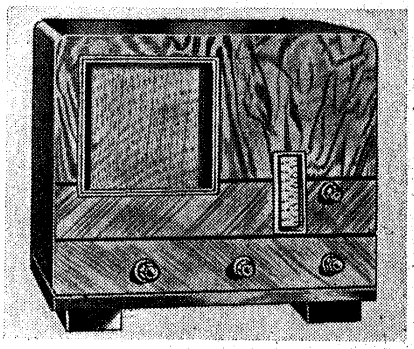
"TRADER" SERVICE SHEET

# 566

REVISED ISSUE OF SERVICE SHEET No. 14

# AERODYNE SWALLOW AND CARDINAL RADIOGRAM



The appearance of the Aerodyne Swallow table receiver.

BAND-PASS input tuning and an image suppression device are included in the first stages of the Aerodyne Swallow receiver, which also bears the model No. 29. It is a 4-valve (plus rectifier) 2-band table superhet, designed to be operated from AC mains of 200-250 V, 50 C/S.

Other features of the circuit are interstation noise suppression and a mains aerial device, while provision is made for the connection of a gramophone pick-up and an external speaker.

One version of the Cardinal radiogramophone employs a chassis which is nearly similar to that in the Swallow table model. The differences, which concern chiefly the introduction of pick-up switching, are fully explained under "Cardinal Radiogram Modifications" overleaf.

The Cardinal radiogram also bears a model number (29A) when it uses a Swallow chassis. Another version of the Cardinal radiogram employed the chassis of the Swan receiver, but this version is *not* covered by this *Service Sheet*, which was prepared from a Swallow receiver.

*Release date, both models*: 1934.

## CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (MW) and **L2** (LW) to capacity-coupled band-pass filter. Primary coils **L3, L4** are tuned by variable condenser **C1**; secondary coils **L5, L6** are tuned by **C2**. Capacitative bottom end coupling by **C4**; top coupling by **C35**, whose capacity is obtained from the proximity of two wires to each other.

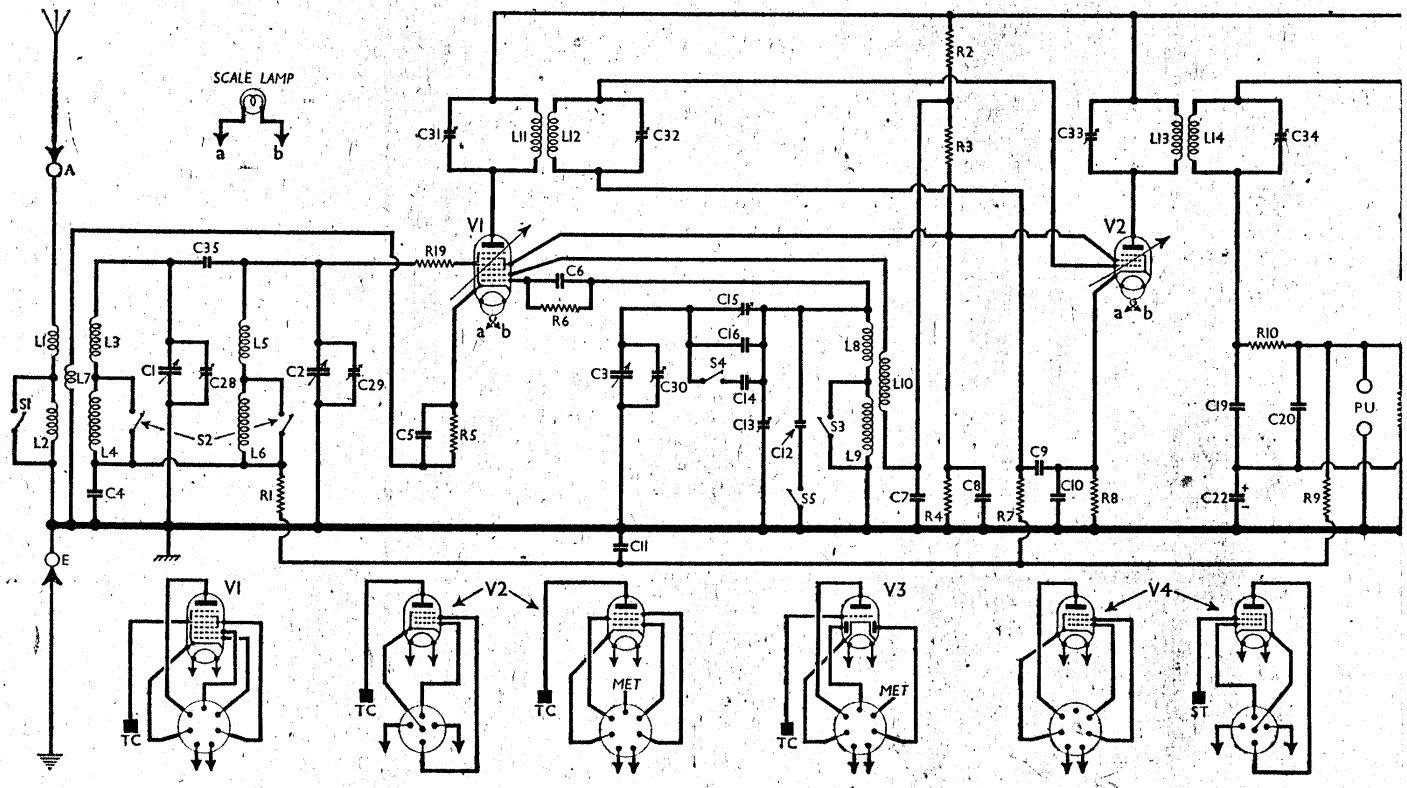
First valve **(V1, Mullard metallised FC4** or **Brimar 15A2)** is an octode operating as frequency changer with electron coupling. Cathode circuit is returned to chassis via the image suppressor coil **L7**, which is adjustably coupled to the aerial circuit.

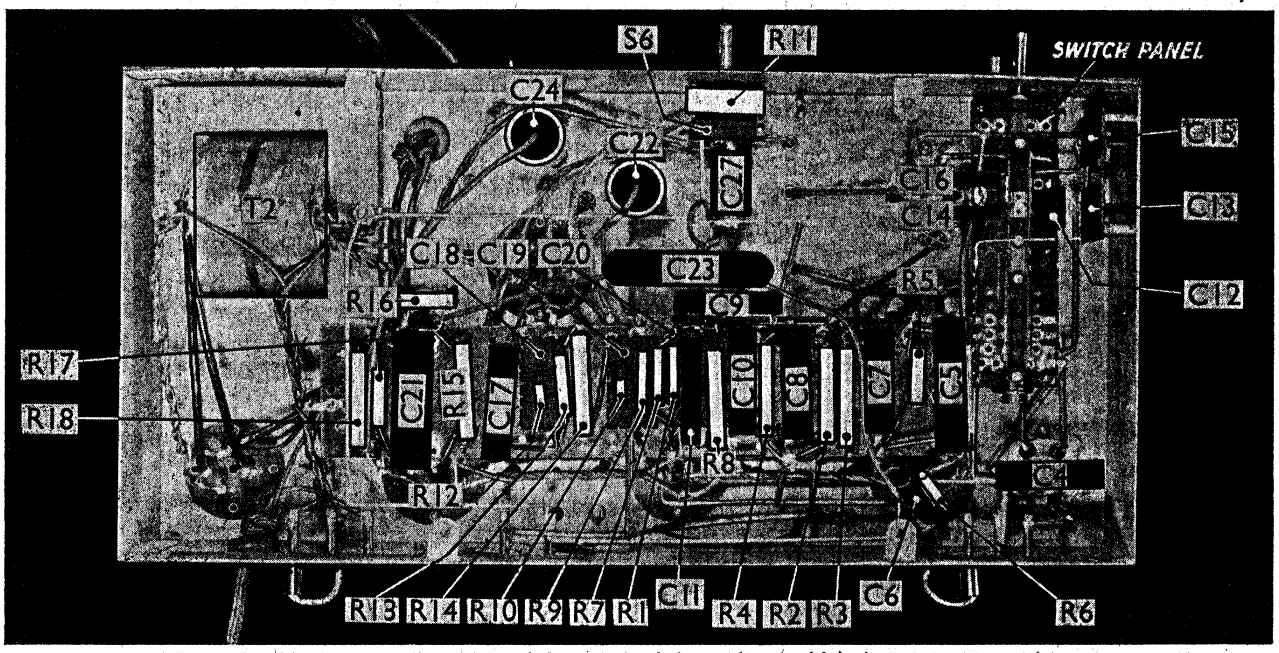
**V1** oscillator control grid coils **L8** (MW) **L9** (LW) are tuned by **C3.** Parallel trimming by **C13** (MW) and **C12, C30** (LW); series tracking by condensers **C14, C15** and **C16** in the high potential end of the circuit: all three are connected in parallel on MW, but on LW **S4** opens, leaving **C15, C16** in parallel as LW tracker. Reaction coupling from oscillator anode by coil **L10.**

Second valve **(V2, Mullard metallised five-pin VP4** or **VP4A)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C31, L11, L12, C32** and **C33, L13, L14, C34.**

**Intermediate frequency 125 KC/S.**

Diode second detector is part of double diode triode valve **(V3, Mullard metallised TDD4)** whose two diode anodes are strapped together to operate as a single diode. Audio frequency component in rectified output is developed across manual volume control **R11,** which also






Under-chassis view. This is normally obscured by a metal base-plate, which has been removed for photographic purposes. The two plugs at the rear of the chassis are: *left*, mains voltage adjustment; *right*, mains aerial plug. The switch unit is shown in detail in col. 3 overleaf.

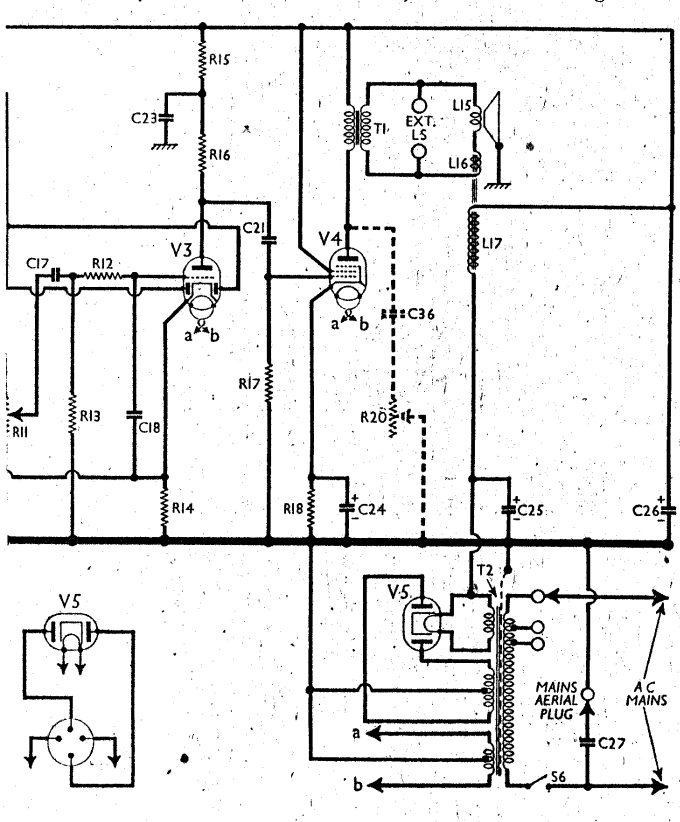
operates as load resistance, and passed via AF coupling condenser **C17**, CG resistance **R13** and **R12, C18** to control grid of triode section, which operates as AF amplifier. The initial action of the diode is delayed by applying to it a biasing voltage obtained from the drop along **R14** in the cathode lead to chassis, so that a fixed degree of inter-station noise suppression is obtained by suppressing signals below a given strength. Grid bias potential for **V3** triode also is obtained from the drop along **R14.**

IF filtering by **C19, R10** and **C20** in diode circuit, and **R12, C18** in triode control grid circuit. Provision is made for the connection of a gramophone pick-up across **R11.**

DC potential developed across **R11** is tapped off and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R16, C21** and **R17** between **V3** triode and pentode output valve **(V4, Mullard seven-pin Pen 4VA).** Variable tone control (if fitted) by **C36, R20** in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1** secondary winding.

HT current is supplied by IHC full-wave rectifying valve **(V5, Mullard 1W3).** Smoothing by speaker field **L17** and electrolytic condensers **C25, C26.** Provision by means of a plug on a flying lead is made for operation on "Mains" aerial. The plug, which is isolated from the mains by condenser **C27,** may be inserted in the aerial socket for mains aerial operation, and when it is not so required, it can be inserted in a second earth socket, which is connected to chassis, when the condenser **C27** operates as a mains RF by-pass.




Circuit diagram of the Aerodyne Swallow AC superhet. **L7** is the image suppressor coil. **C30, C12** and **C13** form the oscillator trimmer condensers; the trackers are **C14, C15, C16,** in the high potential end of the tuning circuit. The tone control circuit, **C36, R20,** is shown dotted, as it was not present in our chassis. Other modifications, including those found in one version of the Cardinal Radiogram, are described overleaf. Valve base connections are shown beneath the circuit diagram, and as **V2** and **V4** are available with five-pin and seven-pin bases, two diagrams are given for each valve.

## VALVE ANALYSIS

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 FC4 | 210 | 3·6 | 60 | 2·0 |
| | Oscillator | | | |
| | 130 | 1·0 | | |
| V2 VP4 | 210 | 3·8 | 60 | 1·5 |
| V3 TDD4 | 40 | 1·6 | — | — |
| V4 Pen4VA | 200 | 35·0 | 210 | 5·5 |
| V5 1W3 | 350† | — | — | — |

† Each anode, AC.

Valve voltages and currents given in the table above are those to be expected

(*Continued overleaf.*)

## COMPONENTS AND VALUES

| | CONDENSERS | Values (μF) |
|---|---|---|
| C1† | Band-pass pri. tuning ... | 0·0005 |
| C2† | Band-pass sec. tuning ... | 0·0005 |
| C3† | Oscillator circuit tuning | 0·0005 |
| C4 | Band-pass bottom coupling ... ... ... | 0·05 |
| C5 | V1 cathode by-pass ... | 0·25 |
| C6 | V1 osc. CG condenser ... | 0·001 |
| C7 | V1 osc. anode decoupling | 0·1 |
| C8 | V1, V2 SG's decoupling | 0·1 |
| C9 | V2 CG decoupling ... | 0·01 |
| C10 | V2 cathode by-pass ... | 0·1 |
| C11 | AVC line decoupling ... | 0·01 |
| C12 | Osc. circ. LW fixed trimmer ... ... | 0·00004 |
| C13‡ | Osc. circ. MW trimmer | 0·00005 |
| C14 | Osc. circ. MW tracker ... | 0·0012 |
| C15‡ | Osc. circ. LW trackers... | 0·0003 |
| C16 | | 0·0005 |
| C17 | AF coupling to V3 triode | 0·05 |
| C18 | IF by-pass condensers ... | 0·0001 |
| C19 | | 0·0003 |
| C20 | | 0·0001 |
| C21 | V3 triode to V4 coupling | 0·1 |
| C22* | V3 cathode by-pass ... | 25·0 |
| C23 | V3 triode anode decoupling ... ... ... | 1·0 |
| C24* | V4 cathode by-pass ... | 25·0 |
| C25* | HT smoothing condensers | 8·0 |
| C26* | | 8·0 |
| C27 | Mains aerial coupling ... | 0·0001 |
| C28‡ | B-P pri. MW trimmer ... | — |
| C29‡ | B-P sec. MW trimmer ... | — |
| C30‡ | Osc. circ. LW trimmer | — |
| C31‡ | 1st IF trans. pri. tuning | — |
| C32‡ | 1st IF trans. sec. tuning | — |
| C33‡ | 2nd IF trans. pri. tuning | — |
| C34‡ | 2nd IF trans. sec. tuning | — |
| C35 | Band-pass top coupling | Very low |
| C36§ | Part variable tone control ... ... ... | 0·05 |

* Electrolytic. † Variable. ‡ Pre-set.
§ Not fitted in our chassis.

| | RESISTANCES | Values (ohms) |
|---|---|---|
| R1 | V1 hexode CG decoupling | 500,000 |
| R2 | V1 SG and osc. anode HT feed and V2 SG HT feed potential divider ... | 10,000 |
| R3 | | 10,000 |
| R4 | | 30,000 |
| R5 | V1 fixed GB resistance ... | 250 |
| R6 | V1 osc. CG resistance ... | 20,000 |
| R7 | V2 CG decoupling ... | 500,000 |
| R8 | V2 fixed GB resistance ... | 200 |
| R9 | AVC line decoupling ... | 500,000 |
| R10 | IF stopper ... | 50,000 |
| R11 | Manual volume control and V3 diode load resistance ... ... | 500,000 |
| R12 | V3 triode grid stopper ... | 50,000 |
| R13 | V3 triode CG resistance ... | 1,000,000 |
| R14 | V3 triode GB resistance... | 1,000 |
| R15 | V3 triode anode decoupling | 10,000 |
| R16 | V3 triode anode load ... | 75,000 |
| R17 | V4 CG resistance... ... | 500,000 |
| R18 | V4 GB resistance... ... | 500 |
| R19 | V1 hexode grid stopper ... | 750 |
| R20* | Variable tone control ... | 50,000 |

* Not fitted in our chassis.

| | OTHER COMPONENTS | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial MW coupling coil | 0·7 |
| L2 | Aerial LW coupling coil | 13·0 |
| L3 | Band-pass primary coils | 3·7 |
| L4 | | 14·0 |
| L5 | Band-pass secondary coils ... ... ... | 3·7 |
| L6 | | 14·0 |
| L7 | Image suppressor coil ... | Very low |
| L8 | Osc. circ. MW tuning coil | 3·0 |
| L9 | Osc. circ. LW tuning coil | 7·0 |
| L10 | Oscillator reaction coil ... | 0·7 |
| L11 | 1st IF trans. Pri. ... | 118·0 |
| L12 | Sec. ... | 118·0 |
| L13 | 2nd IF trans. Pri. ... | 118·0 |
| L14 | Sec. ... | 118·0 |
| L15 | Speaker speech coil ... | 2·5 |
| L16 | Hum neutralising coil ... | 0·15 |
| L17 | Speaker field coil ... | 2,500·0 |
| T1 | Speaker input trans. Pri. ... | 1,000·0 |
| | Sec. ... | 0·3 |
| T2 | Mains trans. Pri., total ... | 16·0 |
| | Heater sec. ... | 0·04 |
| | Rec. heat sec.... | 0·05 |
| | HT sec., total... | 315·0 |
| S1-S5 | Waveband switches ... | — |
| S6 | Mains switch, ganged R11 | — |

### Valve Analysis—(*continued.*)

in an average receiver when the mains voltage adjustment is properly set and there is no signal input. Should **V2** be a Mullard VP4A, the readings obtained may be different from those quoted for it as it has a shorter grid base than the VP4.

Voltages should be measured with a high-resistance meter, whose negative lead should be connected to chassis.

## DISMANTLING THE SET

**Removing Chassis.**—Remove the three control knobs (pull-off) from the front of the cabinet;

remove the two wood screws (with washers) holding the scale assembly to the front of the cabinet;

free the speaker leads from the clip, held by a single wood screw, from the side of the cabinet;

unsolder from the earthing tag on the speaker transformer the wire connecting it to chassis;

remove the four screws (with large metal and rubber washers) holding the chassis to the bottom of the cabinet.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free chassis entirely, unsolder from the connecting panel on the speaker assembly the three leads connecting it to chassis.

*When replacing*, do not omit to insert the metal screening plate beneath the chassis, and also to replace the sponge rubber mounting strips between the screening plate and the bottom of the cabinet.

Connect the single speaker lead to the top tag on the connecting panel, and the braided twisted pair to the bottom (red coded lead) and middle (black coded lead) tags. If the coding is indistinct, the red lead is that which is connected at the chassis end to the heater of **V5**.

Connect the earthing wire to the tag on the frame of the speaker transformer.

**Removing Speaker.** — Disconnect the leads as already indicated, and slacken the nuts holding the four metal clamps to the rim of the speaker;

remove two of the nuts and clamps, when the speaker may be lifted out.

*When replacing*, take care that the tag at the free (rectifier) end of the speaker field is at the bottom of the connecting strip, and then connect the leads as previously indicated.

## GENERAL NOTES

**Switches.—S1-S5** are the waveband switches, in a single ganged unit mounted on a panel beneath the chassis. The panel is indicated in our under-chassis view, and a diagram showing the unit in detail appears in col. 3. The table (col. 3) gives the switch positions for the two control settings. A dash indicates open, and **C**, closed.

**S6** is the QMB mains switch, ganged with the manual volume control **R11**.

**L1, L2, L3, L4, L7** and **L5, L6** are the aerial and band-pass coils, and **L8, L9, L10** are the oscillator coils, in three screened units on the chassis deck. They are indicated in our plan view of the chassis, where the screening cans have been removed to show the coils. Note that **R19** is housed in the **L5, L6** unit. The image suppressor coil **L7** is a single turn coil adjustably mounted in the **L1-L4** unit, and its adjusting screw projects through the top of the can.

The IF transformers **L11, L12** and **L13, L14** are in two further screened units on the chassis deck with their associated tuning condensers.

**External Speaker.**—Provision is made for the connection of a low impedance (3-6 Ω) external speaker across the secondary of the internal speaker input transformer **T1**.

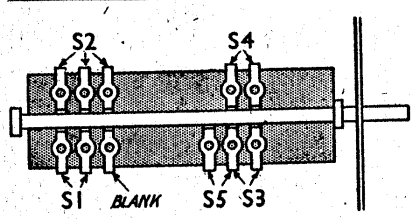
**Condensers C22, C24.**—These are two electrolytic cathode by-pass condensers, rated at 25 μF, 25 V DC peak working. They are in small aluminium containers, mounted in an inverted position beneath the chassis deck. The cans are negative, and rubber leads emerging from their tops are the positive connections.

**Condensers C25, C26.**—These are two 8 μF condensers in a single tubular metal container, mounted on the chassis deck. The can forms the common negative connection. A safe rating for replacement condensers would be 500 V peak.

**Condenser C35.**—This is a very small condenser which provides top coupling between the primary and secondary sections of the aerial band-pass circuit. In our chassis it consisted of the capacity between the two high potential leads connecting the **C1** and **C2** sections of the

### Switch Table and Diagram

| Switch | MW | LW |
|---|---|---|
| S1 | C | — |
| S2 | C | — |
| S3 | C | — |
| S4 | C | — |
| S5 | — | C |




Sketch showing details of the switch unit, when viewed from one end of the chassis.

gang, the two wires being held together by an insulated wire clip. In some chassis, however, it may be formed of a separate pair of insulated wires twisted together.

**Scale Lamp.**—This is an Osram MES type, fitted in a holder behind the scale assembly as indicated in our plan view. It is rated at 6.2 V, 0.3 A.

**Condenser Drive.**—This comprises an arrangement of pulleys and cord to give

a slow-motion drive and a vertical movement of the scale cursor. It can be seen fairly clearly in our plan view of the chassis. The device is simple, and not likely to get out of order. If the cord stretches beyond the limit of the spiral springs inside the condenser pulley, the cord can be shortened by tying a second knot close to the existing one, taking care not to alter the position of the pointer, as otherwise the calibration will be incorrect.

**Valve Types.**—The valve types employed in our chassis were as indicated in the "Circuit Description" and "Valve Analysis" table, but there may be differences in other chassis. Instead of a Mullard FC4, a Brimar 15A2 may be fitted in the position of **V1.** **V2** may be Mullard VP4 or VP4A, and furthermore, either of these may be fitted with a five-pin (as in our sample) or seven-pin base. Similarly, **V4,** which is a Mullard Pen4VA, is available with a five-pin or seven-pin base.

For this reason, two base connection diagrams are given beneath the circuit diagram for **V2** and **V4.** If a seven-pin type is required, and a five-pin type only is available, or *vice versa*, the latter may be substituted for the former if the valve holder is replaced.

**Chassis Divergencies.** — Since the original production, several modifications have been made. A variable tone control device has been added, and this is shown dotted in our circuit diagram. It consists of **C36** and **R20,** which components do not appear in our chassis illustrations.

In some chassis, too, there may be an HT circuit RF by-pass condenser of 0.1 $\mu$F connected between the HT positive line and chassis. Also, **C27** may consist of two 0.0003 $\mu$F condensers connected in series.

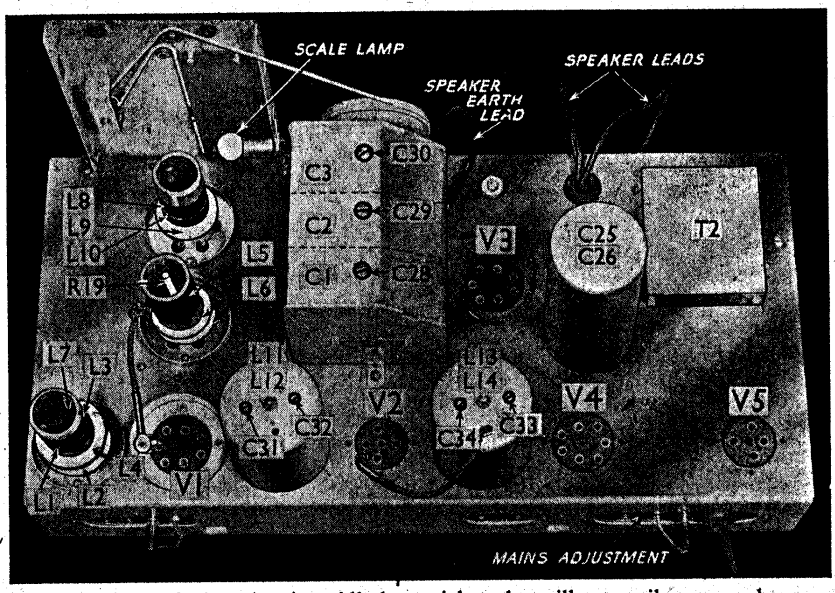
An RF stopper resistance of 100,000 ohms may be connected in series with the lead to **V4** control grid, and **C19** may be 0.0001 $\mu$F instead of 0.0003 $\mu$F.

A more involved modification may be found in the method of obtaining the AVC voltage. In our chassis, the two diode anodes of **V3** are strapped together, but in some cases they are separate and the second diode is used to provide DC potentials in the conventional manner. It is then fed via a 50 $\mu\mu$F (0.00005 $\mu$F) coupling condenser from **V2** anode, and its output is developed across a 2,000,000 load resistance, which is returned directly to chassis.

The rest of the AVC circuit remains as in our sample, except that the top of **R9** is disconnected from the junction of **R10, R11** and connected instead to the junction of the AVC diode anode and its load resistance. Delay voltage is then obtained from the drop along **R14,** in **V3** cathode lead to chassis.

## CARDINAL RADIOGRAM MODIFICATIONS

Two versions of the Cardinal radiogram were produced: one which incorporated a slightly modified Swallow chassis, and another which incorporated a Swan chassis.




Plan view of the chassis. All the aerial and oscillator coil screens have been removed for photographic purposes. **L7** can be seen in the **L1-L4** unit, and **R19** is indicated in the **L5, L6** unit. The adjustment for **L7** projects through the top of the screening can, and the coil is actually supported by the can, although it has been detached from the can and fitted in its normal position in the coil unit for photographing.

This *Service Sheet* covers only that version which uses the Swallow chassis. Little confusion will arise in identifying which of the chassis is used, since the Swan chassis is a simple TRF design, very different in appearance from the Swallow.

The only differences in Swallow-type Cardinal and the table model are that pick-up switching is provided and that two scale lamps are fitted. The additional switching operates as a single-pole, double-throw switch. The common or centre tag is connected to **R12,** at the end which in our diagram is shown connected **C17, R13,** but which is disconnected from them in the radiogram. One outer tag (the "radio" side) goes to **C17, R13,** and the other goes to the upper pick-up lead, which is shown connected to the top of **R11** in our diagram.

The change-over switch forms part of the wavechange switch unit, the additional switches being included on it to connect the pick-up and mute radio in the gram position of the control.

## CIRCUIT ALIGNMENT

As **C13** and **C15** are reached from the side of the chassis, this must be removed from the cabinet for alignment purposes. It is important, however, that the metal screening plate which covers the underside of the chassis should be in position during the operation.

**IF Stages.**—Switch set to LW, turn the volume control to maximum, and connect the signal generator via a 0.01 $\mu$F condenser to **A** and **E** sockets. Feed in a 125 KC/S (2,400 m) signal, and adjust **C34, C33, C32** and **C31** in that order for maximum output, reducing the signal generator output as the circuits come into line.

**RF and Oscillator Stages.**—At the top and bottom extremes of its travel the pointer should be approximately the same distance from the ends of the scales. Connect the signal generator via a suitable dummy aerial to **A** and **E** sockets.

**MW.**—Switch set to MW, and tune to 200 m on scale. Screw up **C28** and **C29** to maximum, and then unscrew them half a turn. Unscrew **C30** to minimum. Screw up **C15** (at side of chassis) to maximum, and unscrew it half a turn, and unscrew **C13** to minimum. Feed in a 200 m (1,500 KC/S) signal, and adjust **C13,** then **C28** and **C29** for maximum output.

**LW.**—Switch set to LW, tune to 2,000 m on scale, feed in a 2,000 m (150 KC/S) signal, and adjust **C15** for maximum output, while rocking the gang for optimum results. Repeat the 200 m adjustments.

The ganging should now hold over both wavebands, but the calibration should be checked at several points on both bands.

**Image Suppressor Adjustment.**—With the set still switched to MW, feed in a strong 350 m (857 KC/S) signal and find the image whistle at about 500 m on scale. Now adjust the image suppressor adjustment which projects through the top of the **L1-L4** coil can for minimum output.

# SERVICE SHEET 555

## A Correction

The Cossor 368 AC mains receiver, which was the subject of our *Service Sheet* 555, was inadvertently described in the heading as a battery receiver.

Dealers are, therefore, requested to delete the word "BATTERY" in the heading so as to avoid the possibility of any confusion arising from the error.

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